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ABSTRACT

With comprehension defined as the ability to specify the relationship between two items, an investigation was conducted to determine the ability of children to relate ideas from several sentences to arrive at answers to questions. This study was a replication of a previous study in which inner-city children participated. In constrast, the subjects were 48 upper-middle-class children in grades 2, 4, and 6. The materials used were three constructed stories in which the sentences were sequenced in three ways: concept organization, attribute organization, or scrambled organization. Below each story were five problem statements typed in a forward order or a backward order. The Newman-Keuls Test was used to multiple comparisons at the .05 level. It was found that (1) children in grade 6 differed significantly from the younger children on percent of correct response; (2) scrambled text differed from the other two; (3) forward and backward order was not significant; and (4) when problems required only one sentence, the responses were significantly higher. In addition, it was noted that the scores for these subjects were substantially higher than those for the lower-class children in the former study. References are included. (DH)

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ABSTRACT

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This paper reports a replication of a study in which children from different grades answered questions requiring that they combine one, two or three sentences from a text to arrive at a correct binary response. The subjects in the present study were upper-middle class children as opposed to inner-city children in the earlier study.

In general, the results replicated findings of the previous study. Children in grades 2, 4 and 6 had difficulty answering questions if sentences had to be related. This was especially true if the text was poorly organized. Second grade performance was especially low if the text was disorganized. This was the only condition in which the 2nd grade suburban children did not exceed the performance of the 5th grade inner-city children of the earlier study.

The factors that confound peoples' ability to comprehend relationships among text items are not simple. Evidently they are not primarily limitations in memory capacity. Studies are underway in which subjects are told what cues in a text indicate that sentences are related. In one study such verbal instructions completely overcame the difficulties in answering multiple-sentence questions. One interesting problem is the persistence of a reader's response to such cues after training. A more fundamental problem concerns a brief taxonomy of these effective cues. Presumably, such cues provide the occasion for the behaviors that produce higher level learning.

RE003 296

Text Organization and its Relationship to Children's Comprehension

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This study was conducted to investigate some of the variables that affect children's comprehension of written materials. Frase (1969, 1970) has found that adult comprehension is affected by the organization of a text and the proximity of the related sentences. Frase and Washington (1970) found that lower-class children were also subject to these same constraints in learing from written materials.

Reading comprehension in this study is defined as the ability to specify the relationship between two items. The levels of comprehension in this study involved discovering relationships within sentences and between two or three sentences. For instance, consider the following sentences. "The red thing was a bag. The bag was full of money." To answer the question, "Was the red thing a bag?" requires one sentence. To answer, "Was the red thing full of money?" requires two sentences. Both

questions require that the reader qualify the concept "red thing" according to the information in the text, but for the latter question the relationship between "red thing" and "full of money" is mediated by "bag." Combining information in this way is an important intellectual act.

Method

Subjects

The Ss were 48 public school children from the 2nd, 4th and 6th grades in East Brunswick, New Jersey. East Brunswick is an upper middle-class suburban community.

Materials

Three different stories were constructed, each describing two concepts. There were four binary attributes. For example, "Tommy found a big thing. The big thing was green. The green thing was a box. The box was empty. He found a small thing. The small thing was red. The red thing was a bag. The bag was full of money." In this example, the attributes are size, color, object and content.

Organization of sentences.--The stories were typed on separate sheets of $8\frac{1}{2} \times 11$" paper. The sentences were sequenced in the following three ways: Concept organization (as in the text example above): Attribute organization ("Tommy found a big thing. He found a small thing. The big thing was green. The small thing was red." etc.);

and Scrambled organization (in which the order of sentences favored neither the Attribute nor the Concept organization, i.e., the sentences were not organized consistently. Brief incidental introductory material was typed at the beginning of each story.

Level of problem.--Five problem statements were typed below each story. The responses "yes" and "no" were typed to the right of each statement. The Ss were to circle the appropriate answer depending upon whether the statement corresponded to the information in the story. Of these five statements, the second and fourth were false filler items. In order to confirm the three test statements, different numbers of sentences were required: One sentence (e.g., "The big thing was green."), Two sentences (e.g., "The big thing was a box."), or Three sentences (e.g., "The big thing was empty.") The sentences relevant to these problem statements were surrounded by other sentences so that Ss could not answer a question by looking at the first or last part of the text. The true problem statements always related to one of the two concepts described in the text.

Order of problems.--The problems were typed in a Forward order (One, filler item, Two, filler item, Three) or a Backward order (Three, filler item, Two, filler item, One). In the Forward order, the easiest problems occurred first.

Procedure

The task was presented as a reading game in class. The Ss were instructed to find the answers to the questions in the stories. They were told that some of the stories were harder to understand than others. Three examples of how to respond to the questions were given on the blackboard. The examples were confined to simple response demonstrations with only one sentence.

All Ss read the three passages, but each passage was organized differently (Concept, Attribute or Scrambled). The Ss were allowed 8 min. on each passage and they were told when to proceed to the next passage. They were instructed not to guess if they could not solve a problem. Before proceeding to the next passage, E verbally confirmed that all Ss had attempted each problem.

In each grade, 24 Ss received the Forward order of problems and 24 Ss received the Backward order. Organization was completely counterbalanced within each group of 24 Ss.

Design

The ANOVA of correct responses was a 3 (Grade) X 2 (Order of Problems) X 3 (Organization of Sentences) X 3 (Level of Problem), with repeated measures on the last two factors. The Newman-Keuls test was used for multiple comparisons at the .05 level.

Data for grades 2, 4 and 6 reveal that the percent of correct responses was 76, 77 and 89; $\underline{F}$ (2,138) = 5.6, $\underline{p}$ < .005. Grade 6 differed from grades 2 and 4.

Percent of correct responses for concept, attribute and scrambled organizations was 89%, 83% and 70%; $\underline{F}$ (2,276) = 30.6, $\underline{p}$ < .001. Scrambled text differed from the other two. The interaction between passages and grade was significant; $\underline{F}$ (4,276) = 5.4, $\underline{p}$ < .001.

Insert Figure 1 here

Percent of correct responses for forward and backward order was 80.6 and 81.7 respectively. This effect was not significant.

Percent of correct responses for problems requiring one, two and three sentences was 96%, 74% and 72% respectively; $\underline{F}$ (2,276) = 54.5 $\underline{p}$ < .001. The problems requiring one sentence were significantly different from the problems sentences requiring two and three sentences. The interaction between passage and question was also significant; $\underline{F}$ (4,552) = 6.3, $\underline{p}$ < .001.

Insert Table 1 here

Insert Figure 2 here

Discussion and Summary

The present data confirm that children are affected by the organizational structure of written materials, and they suggest that children in later grades may be less influenced by poor organization than younger children (Fig. 1). The data also indicate that questions requiring more than one sentence are especially difficult if a text is poorly organized (Fig. 2).

Frase and Washington (1970), in a study which used these same materials with lower-class children, found that the scores for those children were substantially lower than for the upper-middle class children in this study. Essentially, the second grade children of the present study out-performed the fifth grade children of the earlier study, except when the text was disorganized. Data on reading level were not available for this study nor in the earlier study (Frase and Washington, 1970). Thus it is not clear whether the increase in comprehension across grades and groups of Ss is due to differences in reading level, intellectual skills or some combination of factors.

The sharp difference in performance between the problems requiring one sentence and those requiring two or three sentences is very pronounced. The present data corroborate studies with adults and children in this respect.

Two simple, but different, hypotheses might account for the difficulty that people have in detecting and recalling relationship's that are mediated by other items. First, the difficulty could be a matter of short-term memory. Once having

read a sentence a subject forgets important nouns and phrases. When he reads another sentence, therefore, he does not detect a recurrence of those nouns or phrases. A second hypothesis asserts that peoples memory capacities are not so feeble, but that ordinarily a reader does not make such explicit relationships because a recurrence of a particular noun or phrase may be obscured by semantic or syntactic factors. If the latter hypothesis were true, then predifferentiation of the verbal classes in a text should greatly reduce the difficulty of comprehending a relationship between sentences. Washington is now in the process of completing a study in which children were told before they read what verbal classes would be mentioned. Preliminary data indicate that Ss prompted in this way answer multiple-sentence questions as well as single sentence question, whereas unprompted Ss are about 30 percentage points below the prompted Ss. For single sentence questions, however, the prompted and unprompted Ss perform at the same level. The difficulty of detecting relationships between sentences thus seems to be a matter of appropriately partitioning the various textual units, rather than a problem of short-term memory.

References

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Frase, L. T. Influence of sentence order and amount of higher level text processing upon reproductive and productive memory. American Educational Research Journal, 1970, 7, 307-319.

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Table 1

Percent Correct Solution as a Function of Grade Level, Order of Questions, and Level of Questions

Grade	Question Order	Sentence Required		
		One	Two	Three
2nd	Forward	88.9	62.5	70.8
	Backward	93.0	75.0	68.1
4th	Forward	100.0	72.2	70.8
	Backward	94.4	69.4	59.4
6th	Forward	98.6	79.2	81.9
	Backward	100.0	90.3	84.7

Figures

Fig. 1. Interaction between grade level and type of passage organization.

Fig. 2. Interaction between question level and type of passage organization.

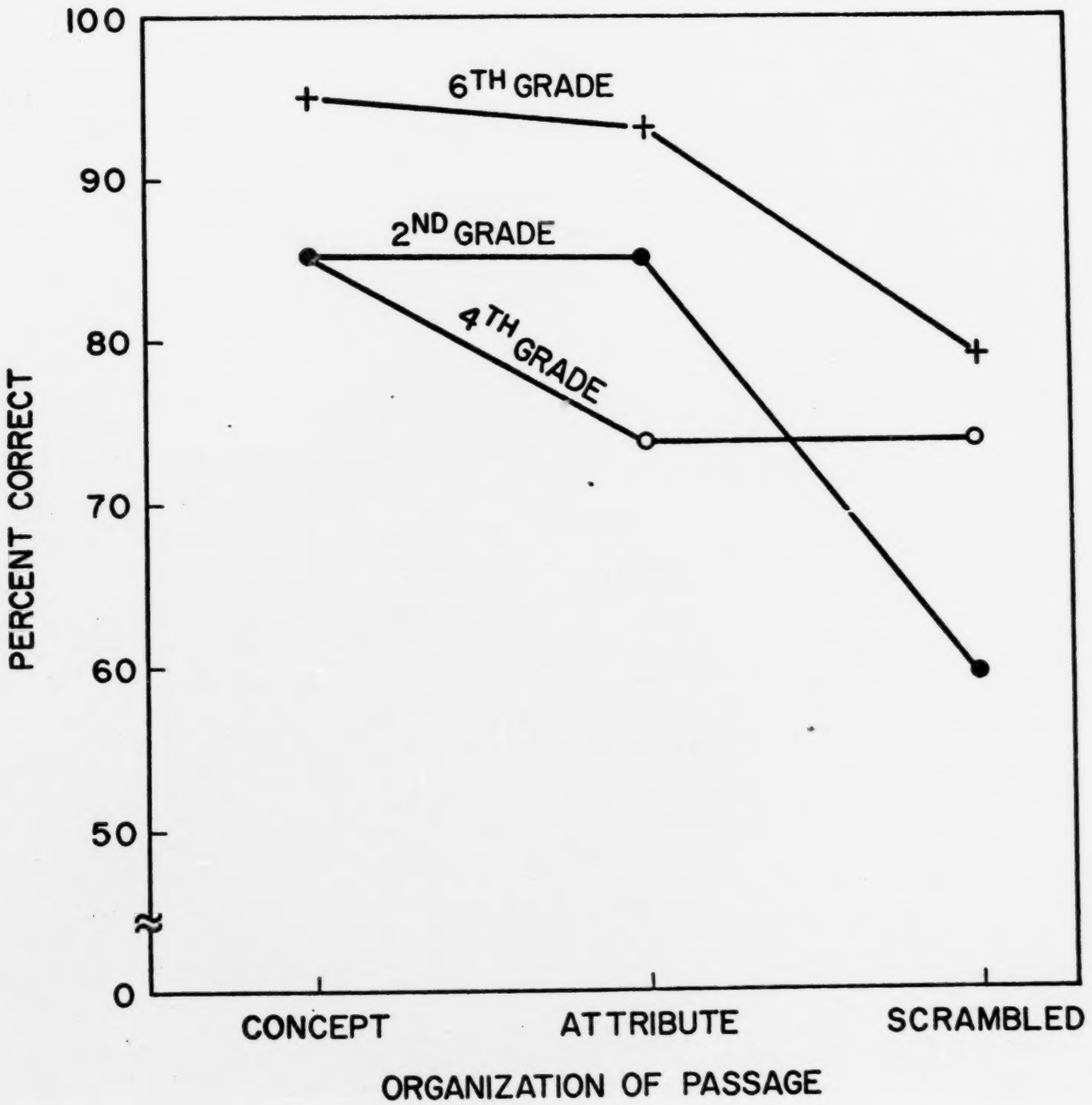
100
90
80
70
60
50
0
PERCENT CORRECT
6TH GRADE
2ND GRADE
4TH GRADE
CONCEPT
ATTRIBUTE
SCRAMBLED
ORGANIZATION OF PASSAGE

Figure 1

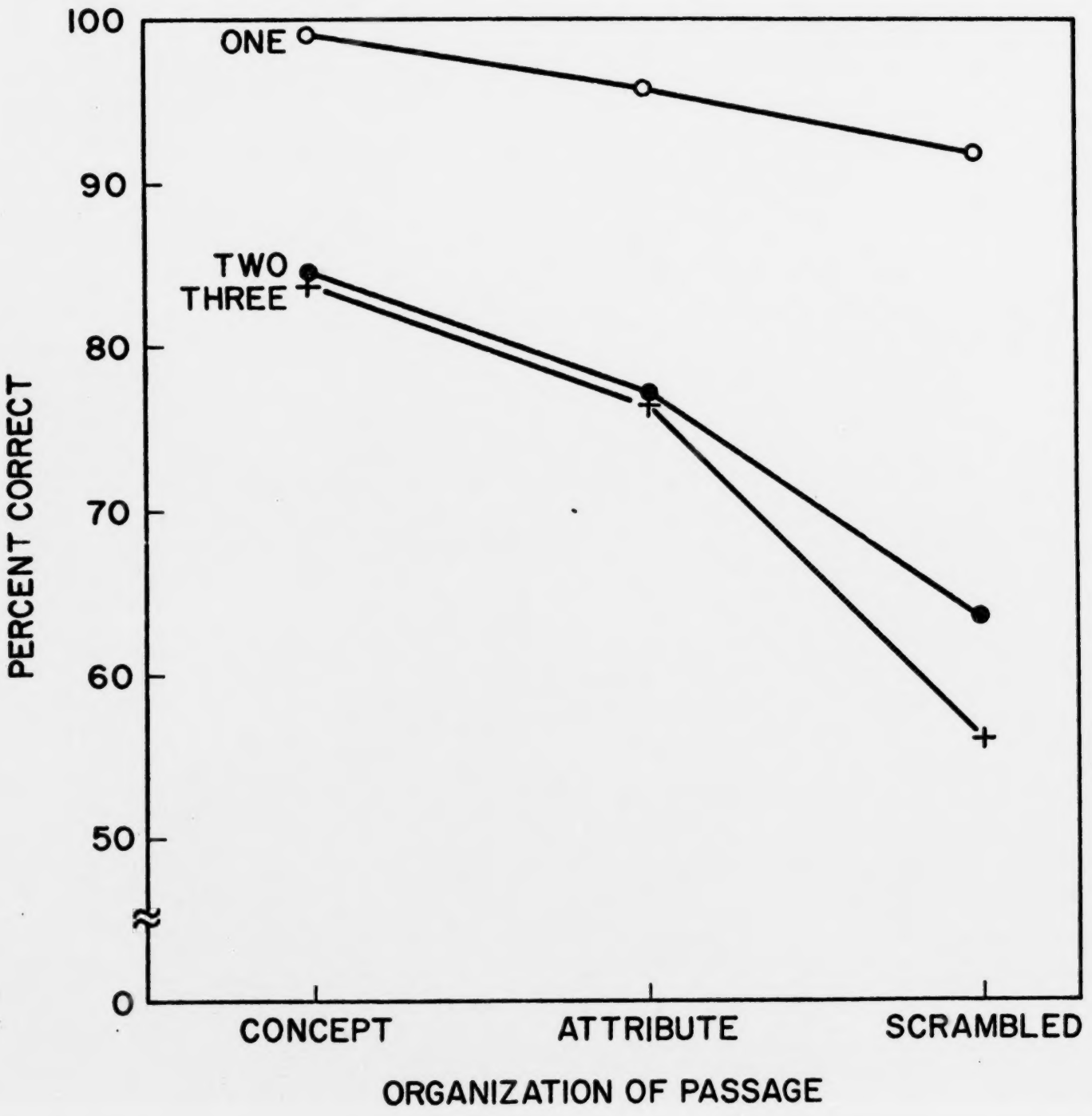
100
90
80
70
60
50
0
PERCENT CORRECT
ONE
TWO
THREE
CONCEPT
ATTRIBUTE
SCRAMBLED
ORGANIZATION OF PASSAGE

Figure 2